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Reducing Grasshopper Damage by Regrassing Weedy Roadsides and Fence Rows

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SEPARATE

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INTRODUCTION

Grasshoppers are widely known as general plant feeders, but they do not inhabit or attack all kinds of vegetation to the same extent. Sorghums, for example, are often uninjured while other crops surrounding them are completely devoured. In general, areas covered with broad-leaved weeds are highly attractive to grasshoppers for both feeding and egg deposition. Perennial grasses, both native and cultivated, are less susceptible to grasshopper attack than are most other kinds of vegetation. This difference in selectiveness makes it possible to reduce grasshopper populations along field margins by replacing the weeds with grasses.

The investigations reported here have been carried on in the northern Great Plains during years when *Melanoplus mexicanus* Sauss. has been the dominant grasshopper species. Like most of the other major species, it prefers to lay its eggs in weeds rather than grass. A few species, however, of which *M. differentialis* (Thos.) is an outstanding example, prefer grassy associations for egg deposition. Where such species are dominant, grassing of field margins probably would have no value as a control measure. Fortunately, *M. differentialis* infests only a limited area in the northern Great Plains, having its greatest distribution farther south.

¹ Recognition is due J. R. Parker, in charge of the Bozeman, Mont., laboratory of the Bureau, for his criticism of the manuscript and F. D. Butcher, of the same laboratory, for his assistance in obtaining field data.

IMPORTANCE OF FIELD MARGINS AS GRASSHOPPER-BREEDING AREAS

Field margins, including roadsides, constitute approximately 5 percent of the total cropped acreage of the northern Great Plains. They actually comprise a much greater percentage of the total area favorable to grasshopper egg laying when such low-populated habitats as fallowed or plowed ground, truck crops, corn, sorghums, and prairie land are excluded.

In the northern Great Plains grasshoppers select the unproductive land surrounding cropped fields more often than any other habitat as a place for egg deposition. Extensive observations in eight study areas over a 9-year period, 1936-44, show that field margins contain about twice as many egg pods per square foot as the second most heavily populated habitat (idle lands) and about three times as many as the average in all habitats. The numbers of egg pods in the field margins continue to be comparatively high year after year, irrespective of the general egg-population level.

<i>Habitat</i>	<i>Number of egg pods per square foot</i>
Field margins.....	0. 836
Idle land.....	. 540
Legumes.....	. 384
Pasture.....	. 371
Small grain.....	. 332
Flax.....	. 323
Crested wheatgrass.....	. 314
Prairie.....	. 293
Wild-hay meadow.....	. 200
River-bottom land.....	. 128
Truck crops.....	. 118
Corn.....	. 112
Sorghums.....	. 092
Plowed or fallowed land.....	0
Average.....	0. 289

The presence of large numbers of eggs around the edges of cultivated fields is a constant threat to the crops. When grasshopper populations are generally low, the field margins are important sources of future increases. When the populations are moderate, they work into and eat off the crop plants in the adjacent margins of the cropped fields. Although field margins are relatively less important during years of general grasshopper outbreaks, nevertheless countless numbers of grasshoppers are sheltered in such places and increase the destructive hordes.

FIELD MARGINS PRESENT OBSTACLES TO CONTROL PRACTICES

Vegetation in the field margins in the northern Great Plains is made up of broad-leaved weeds, occasionally of prairie grass, and often of a combination of the two. When this region was settled, the first farming task was to plow up the native prairie sod, which formed an unbroken ground cover over the entire region. The vegetation outside

the newly plowed fields consisted of undisturbed prairie grasses. Much of this native sod was eventually destroyed by plowing, by dragging farm machinery over it, by the grading of roads, or by being covered with soil blown from the fields. Most of the field margins at present are composed of mixtures of grass and weeds, but for grasshopper-control work most of them can be considered as weedy.

Satisfactory control of grasshoppers breeding in field margins can be accomplished only by overcoming several obstacles peculiar to this type of habitat. During years of low or even moderate infestations the farmers are disinclined to bait grasshoppers. In outbreak years many field margins a short distance from baited fields or adjacent to idle land remain untreated and are sources of quick reinfestations of nearby baited fields. Dense, tall, weedy vegetation associated with field margins (figs. 1 and 2), greatly lessens the effectiveness of the bait. Cultural control, such as plowing, cannot be readily practiced along field margins because of such obstructions as fences, ditches, and steep banks. To effect a dependable control of grasshoppers in field margins, at least some of these conditions must be changed. It is with this objective in mind that grassing of weedy margins is suggested.



FIGURE 1.—Weedy roadside, a favorable grasshopper habitat.



FIGURE 2.—Weedy fence row, an ideal habitat for grasshopper-egg concentrations.

GRASSY VERSUS WEEDY FIELD MARGINS

Studies have shown marked differences in grasshopper abundance in different types of plant cover along field margins. These differences, as has been stated, are readily noticeable in grassy and weedy habitats. As may be seen in table 1, nymphs, adults, and egg pods were all less abundant in the grassy margins. The average numbers of nymphs and adults associated with grassy habitats in the seven study areas were less than 40 percent of those recorded in weeds.

As to infestation of crops the following year, the number of eggs present is more important than the number of nymphs or adults in grass or weed associations. The grassy field margins contained an average of only about 58 percent as many egg pods as the weedy margins (table 1). Other surveys in the same areas, summarized in table 2, showed only about 40 percent as many egg pods in 1943 and 77 percent as many in 1944 in grassy margins as in weedy margins. For the 2 years the average number of egg pods per square foot in grassy field margins was about 53 percent of the number found in the weedy margins. These data strongly indicate that if weedy field margins were restored to native grass the grasshopper populations in them would be lowered more than 50 percent.

Native grass (fig. 3), although not favorable to grasshopper populations, is difficult to replace once it has been plowed up. Prairie sod

TABLE 1.—*Numbers of nymphs, adults, and egg pods in weedy and grassy field margins in 7 northern Great Plains study areas, 1944*

Study areas	Grasshoppers per square yard in—					
	Weeds			Grass		
	Nymphs	Adults	Egg pods	Nymphs	Adults	Egg pods
Mandan, N. Dak.-----	10. 30	2. 66	1. 735	4. 38	2. 66	1. 647
Dickinson, N. Dak.-----	4. 29	4. 58	. 304	4. 22	4. 20	. 217
Beach, N. Dak.-----	13. 55	12. 71	. 960	2. 12	1. 92	. 600
Huntley, Mont.-----	6. 74	13. 39	1. 000	1. 69	3. 50	. 393
Havre, Mont.-----	4. 58	3. 14	. 778	1. 69	1. 00	. 120
Gildford, Mont.-----	2. 90	5. 95	. 577	1. 00	2. 00	. 080
Brinkman, Mont.-----	7. 32	2. 50	. 432	4. 18	1. 90	. 273
Average-----	7. 10	6. 42	. 827	2. 75	2. 45	. 476

that was plowed 20 to 40 years ago still contains many weeds. Many more years will pass before the native-grass sod will become fully re-established in these reverting fields. It is evident, therefore, that in a regrassing program a substitute grass combining rapid growth and quick adaptation is needed. Crested wheatgrass possesses both these qualities.

To obtain data on the grasshopper-resistant qualities of crested wheatgrass, studies were conducted on two study areas in North Dakota during 1943 and 1944. These particular study areas were selected for the investigations because they contained sufficient plantings of crested wheatgrass for adequate comparison with both weedy and native-grass habitats, and also because they were representative of most of the

TABLE 2.—*Egg-pod populations in weedy and native-grass field margins in 7 northern Great Plains study areas for 1943-44*

Year	Weedy field margins		Native-grass field margins	
	Number of 1-square-foot samples	Average number of egg pods per square foot	Number of 1-square-foot samples	Average number of egg pods per square foot
1943-----	172	1. 240	189	0. 490
1944-----	197	. 716	174	. 552
Average-----		. 978		. 521



FIGURE 3.—A native-grass fence row, a type of habitat that reduces hopper concentrations.

agricultural area of the northern Great Plains. As shown in table 3, native-grass sod had an egg-pod population of about half that recorded for weeds for each of the 2 years. Crested wheatgrass sod contained even fewer pods, about 24 percent as many being present in this sod as in weedy margins in 1943 and only 7 percent as many in 1944. The averages for the 2 years show that native grass had only 55 percent as many egg pods as weeds and crested wheatgrass only 17 percent as many. These percentages indicate that crested wheatgrass is considerably less attractive to grasshoppers than is the native grass.

TABLE 3.—*Egg-pod populations for 3 different types of plant cover along field margins on 2 study areas in North Dakota 1943-44*

Year	Weedy margins		Native-grass margins		Crested wheat-grass margins	
	Number of 1-square-foot samples	Average number of pods per square foot	Number of 1-square-foot samples	Average number of pods per square foot	Number of 1-square-foot samples	Average number of pods per square foot
1943-----	58	1. 086	69	0. 565	50	0. 260
1944-----	43	. 767	49	. 449	35	. 057
Average-----	-----	. 927	-----	. 507	-----	. 158

Although a more comprehensive comparison of egg populations in crested wheatgrass and native grass might show a smaller difference, it is apparent that crested wheatgrass is at least as efficient as native grass in keeping down grasshopper infestations.

The question might logically be asked, What happens to those grasshoppers that normally inhabit the weedy field margins after these margins have been grassed? Or, Isn't it true that the grasshoppers will continue to breed in nearby locations even under conditions of severe drought and cold, and remain a menace to the crops? The answer is that when the broad-leaved weeds are replaced by grasses many of the grasshoppers that would have remained and laid eggs in the margins move into the adjacent fields, where they can be destroyed by cultural measures. It is also true that any reduction in the proportion of favorable breeding grounds in an area will reduce the total number of grasshoppers that will continue to inhabit the area.

CRESTED WHEATGRASS AN IDEAL COVER FOR FIELD MARGINS

Crested wheatgrass has been found to be admirably suited to conditions on the northern Great Plains. This perennial grass, the seed of which was imported from Russia some years ago, has outstanding qualities of adaptability and survival, even in seasons of severe drought. Its ability to crowd out all weed growth (fig. 4), an essential factor in grasshopper control, is commonly recognized. Once it is established, no further care is required for its maintenance. Plantings at least 15 years old still maintain dense, sturdy stands, giving evidence of its persistence and durability.

For feed, crested wheatgrass is excellent, and in value it compares favorably with other forage plants. Hay made from it is only



FIGURE 4.—Crested wheatgrass fence row, a type less attractive for grasshopper-egg laying than weedy cover.

slightly inferior to alfalfa hay. Because this grass grows at a lower temperature than do most native grasses, it provides a welcome source of pasture forage early in the spring and late in the fall, when cultivated crops are not present in the fields.

Crested wheatgrass seed can be obtained generally throughout the northern Great Plains at reasonable prices. Seeding is generally done late in the fall, with an ordinary grain drill, although a seed-drill attachment may be used to advantage. Seed may also be broadcast, but this method often results in a poorer stand of grass. It is not necessary to prepare the soil for a seedbed, because successful seeding can be accomplished by merely pulling the drill through the weeds. When the weed growth is too rank to allow the drill to pass through it readily, mowing may be necessary. From 5 to 10 pounds of seed per acre is recommended, although solid stands of grass are obtained in a much shorter time where more seed is used. The time required to establish a solid stand of grass is about 3 years from the time of seeding; however, this time may vary somewhat, depending on the weather.

OTHER GRASSES MAY PROVE VALUABLE

Although this circular is confined to a discussion of the reductions in grasshopper populations to be brought about by replacing broad-leaved weeds by native or prairie grass and crested wheatgrass, some evidence has been obtained to indicate that other grasses may also have value for this purpose. The possibility of substituting other grasses for crested wheatgrass probably depends chiefly on their growth habits and cultural response. The two main factors essential to grasshopper control are, first, that the weeds be crowded out; and second, that the grass cover most of the ground so as not to leave large, exposed, bare spaces. Combinations of two or more different grasses may prove to be effective.

GRASSING FIELD MARGINS AS A FARM PRACTICE

Grassing of field margins such as fence rows, roadsides, ditchbanks, and headlands should be a profitable farm practice. Not only will it reduce an important source of grasshopper damage, but it should also result in several other advantages. It will eliminate a common source of broad-leaved and other weeds that are an annual menace to crops. It will stop or prevent soil erosion, especially gullying along drainage courses in fields or along roadsides; in fact, it is advocated by the Soil Conservation Service of the United States Department of Agriculture for both weed and soil-erosion control in the northern Great Plains. It would also tend to prevent the formation of snowdrifts which are often caused by tall weeds along graded roads.

Furthermore, the increased farm returns from the grassed areas are worthy of consideration. On a 320-acre farm 16 acres, or approximately 5 percent, is composed of relatively unproductive field margins. The 16 acres, if converted to hay production or pasturage, would contribute a considerable amount to the total feed supply of the farm. In districts where untended livestock is not allowed on rights-

of-way and fencing is unnecessary, the entire area between cultivated fields and graded roads could be sloped and grassed, and the hay crop could be harvested by usual methods. If hay production were not practical, the grassed field margins would be available for pasturing at least part of the year.

GRADING PROJECTS SHOULD INCLUDE PLANS FOR GRASSING

Where large quantities of dirt are moved in making cuts and fills, the slopes should be graded, if possible, so that grass can be established. Such projects as earth dams, irrigation or drainage ditches, contour terraces, and farm roads, should be planned with grassing in mind. Road construction by public agencies, especially, should take into account grasshopper control, as was done in the construction of the road shown in figure 5. Good farm roads are invaluable to the farmer, but if by their construction long stretches of weedy roadsides favorable to grasshopper breeding are established (fig. 6), some of their value has been offset.



FIGURE 5.—A roadside seeded to grass. It was graded and sloped purposely for grassing. Grasshoppers are less numerous in this type of habitat than in weeds.



FIGURE 6.—Graded road with steep banks, not planned for grassing. The weeds developed the first season.

SUMMARY

The most favored grasshopper-breeding locations in the northern Great Plains are the field margins. Control measures are difficult to apply along field edges, because of such physical obstacles as fences, steep banks, and tall weeds, not to mention the barrier of disinterest on the part of the farmer when serious damage does not seem imminent.

Replacing broad-leaved weeds with perennial grasses greatly reduces the number of grasshoppers in these locations and the amount of control otherwise needed. Baiting, when necessary, should result in a greater kill of grasshoppers in grassy field margins than in weedy margins.

Native or prairie grass, although attracting few grasshoppers, requires such a long period of time to become established that its use is not feasible in a regrassing program. Crested wheatgrass, on the other hand, besides having grasshopper-resistant qualities, is also easily and quickly established. This grass readily crowds out all weed growth, being ideally suited to northern Great Plains conditions. Experimentation may lead to the discovery of other grasses

or combinations of grasses that may prove to be suitable in a regrassing program.

Grassed field margins are beneficial to the farming enterprise in other ways than in controlling grasshoppers. Weed elimination and the prevention of soil erosion are two important associated benefits. Increased farm returns derived from the grass grown along the otherwise unproductive field margins may also be of considerable importance.

Plans for earth dams, large ditches, graded roads, and other projects that involve the movement of large amounts of dirt, should include the establishment of grass on such areas.

